Hodgkin's Disease , Brain Cancer, and Leukemia Incidence and Mortality in a Section of Revere 1969-1983

The Division of Environmental Epidemiology and Toxicology received a letter from a citizen of the Point-of-Pines area in Revere. Concern was raised over what appeared to be a high number of Hodgkin's Disease , brain cancer, and leukemia cases in residents of this area. The accompanying map (Figure 1) illustrates the location of the Point-of-Pines area, as well as the boundaries of the eight census tracts in Revere. This investigation will review both mortality and incidence data for Hodgkin's Disease , brain cancer, and leukemia in Revere and in Point-of-Pines residents from 1969-1983. The mortality data were supplied by the Department's Division of Health Statistics and Research, while the incidence data were supplied by the Cancer Registry.

Background on Statistical Significance

The Standardized Mortality Ratio (SMR) is used to compare cancer mortality in a town to the state as a whole. The SMR is calculated as follows:

$$\frac{\text{observed number of cancer deaths}}{\text{expected number of cancer deaths}} \times 100$$

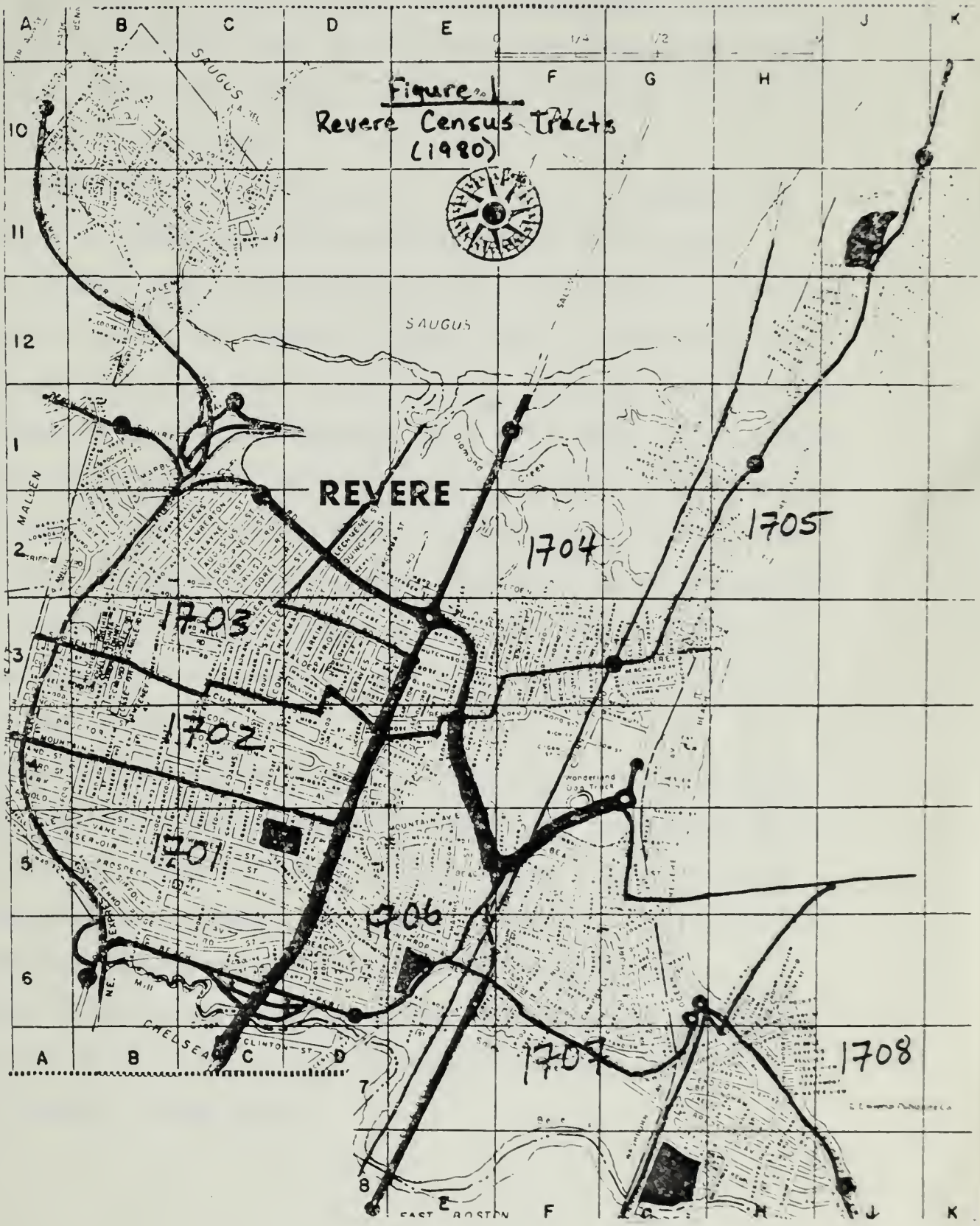
Figure 1
Revere Census Tracts
(1980)
REVERE
SAUGUS
MALDEN
CHELSEA
EAST BOSTON
1701
1702
1703
1704
1705
1706
1707
1708

An SMR of 100 indicates a town has experienced the same number of deaths as expected based on statewide rates. An SMR greater than 100 means more deaths were experienced than expected, while an SMR less than 100 means fewer deaths were experienced than expected.

The interpretation of an SMR depends on two things: its magnitude and its stability. Two SMRs may have the same magnitude but not the same stability. AN SMR of 200 may represent six observed deaths and three expected deaths, or 600 observed deaths and 300 expected deaths. In the former case, the 100% excess of observed deaths represents three additional deaths over the expected number; one or two fewer observed deaths would change the SMR a great deal. In the second case, the 100% excess of observed deaths represents 300 additional deaths over the expected number; even if there were several fewer observed deaths, the SMR would hardly change. When the observed and expected numbers of deaths are relatively large, the value of the SMR is stable; its interpretation would remain roughly the same even if several fewer (or more) deaths had been observed.

A statistical test which assesses both the stability and size of the SMR is the chi square test. The chi square test measures the probability that the difference between the observed number of deaths and the expected number of deaths could occur due to chance. The standard convention in such a test is to call the difference between the observed and the expected deaths "significant" if the probability of the difference occurring due to chance is less than 5 in 100 (or 0.05). If the expected number is less than 5, the Poisson probability is calculated.

Revere - Mortality Data

Mortality data for the city of Revere from 1969-1983 were reviewed first. Table I shows the expected and the observed number of deaths for Revere for Hodgkin's Disease , leukemia, and brain cancer as causes of death. The expected values for Revere are based on statewide rates. For the 1969-1973 period, the 1970 populations of Massachusetts and Revere were used, and for the 1979-1983 period, the 1980 populations were used.

Table I

Cancer Mortality Data for

Revere (1969-1983)

	Hodgkin's Disease			Brain Cancer			Leukemia		
	Obs.	Exp.	SMR	Obs.	Exp.	SMR	Obs.	Exp.	SMR
1969-1973	11	4.5	244*	6	7.0	86	18	15.8	114
1974-1978	3	3.5	86	10	8.5	118	24	16.5	145
1979-1983	1	2.4	42	6	10.0	60	20	17.1	117

* statistically significant

No unusual pattern appears for any of these diseases for the town of Revere. Hodgkin's Disease was significantly elevated for the first 5-year period, but has since decreased to levels below expected.

The next step was to review these causes of death in the Point-of-Pines area. Revere's population is divided into eight census tracts (CT) (see Figure 1). Point-of-Pines is located in CT 1705. Mortality data for 1969-1983 were reviewed for this area, but statistical analyses were performed only for the latest 5-year period, 1979-1983. All death certificates of Revere residents who died of Hodgkin's Disease, brain cancer, or leukemia were pulled to determine place of residence at death. The cases were then plotted on a map of Revere to determine in which CT they resided. Since CT 1705 was of particular interest, only data from CT 1705 are reported. For the 15 year period, 1969-1983, no deaths occurred due to Hodgkin's Disease in CT 1705, one death due to brain cancer occurred (in 1977), and 12 deaths due to leukemia occurred, four in each of the 5-year periods.

Looking at the 1979-1983 period, no brain cancer deaths occurred in residents of CT 1705. However, brain cancer can be classified a number of different ways. One is malignant brain cancer, and another is brain cancer of uncertain behavior, i.e., it is not known whether the tumor is malignant or benign. The data mentioned previously included only deaths classified as malignant brain cancer. For 1979-1983 in CT 1705, two deaths occurred from

brain cancer of uncertain behavior. This compares to an expected value (for the two classifications combined) of 1.7 deaths. The observed and expected are about the same. For leukemia, we would have expected 2.4 cases vs. the four observed. The numbers are too small to be very meaningful, but they are at least not alarming.

Of the four leukemia and two brain cancer deaths occurring in CT 1705 in 1979-1983, none were from the Point-of-Pines area.

Cancer Incidence Data - CT 1705

The state of Massachusetts now has a Cancer Registry. By law, hospitals in this state are required to report newly diagnosed cases of cancer to the Cancer Registry within six months of diagnosis. The Registry began operating in 1982. The 1982 data are now available, and most of the 1983 data are also available.

The Cancer Registry provided this division with data on Revere residents who had been diagnosed with either Hodgkin's Disease , leukemia, or brain cancer in 1982 or 1983. The places of residence of these individuals were reviewed to determine if any of them lived in Point-of-Pines area. No cases, however, of any of these diseases in Point-of-Pines residents were reported to the Cancer Registry. There were six cases of other types of cancer in this area reported in 1982 and 1983. The letter received by the Division did report a number of Hodgkin's Disease, leukemia, and brain cancer in

Point-of-Pines residents. What appears to be a discrepancy between the letter and the Cancer Registry data could well be due to the fact that the cases now living in Point-of-Pines were diagnosed prior to 1982 or after 1983. It is also possible that the 1983 data from the Cancer Registry is not yet complete. In any event, the Cancer Registry will be monitored for future incident cases in Point-of-Pines.

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